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THE CURRENT STATE OF DRONE LAW AND THE FUTURE OF DRONE DELIVERY

I. INTRODUCTION

Unmanned Aerial Vehicles (UAVs) have been around for almost a century,¹ but these flying machines have primarily been regarded as primitive military weapons.² Today, however, the use of UAVs (otherwise known as “drones”) has been transformed into a versatile tool utilized by the public in numerous private and commercial realms. Indeed, the modern drone has countless applications.³ For example, drones have been successfully introduced into the law enforcement field⁴ and the film industry.⁵ They have been applied to hurricane hunting, 3-D mapping, wildlife conservation, agricultural development, and search and rescue operations.⁶ Other current uses include oil and gas exploration⁷ and disaster response.⁸ Additionally and unsurprisingly, UAVs have still experienced widespread popularity among hobbyists.⁹

Along with the development of new UAV applications, the economic benefits offered by the UAV market have simultaneously increased.

1. Mark Edward Peterson, *The UAV and the Current and Future Regulatory Construct for Integration into the National Airspace System*, 71 J. AIR. L. & COM. 521, 538–39 (Summer 2006) (describing the Curtiss Sperry Aerial Torpedo, “the first pilotless flight of a specifically designed pilotless aircraft”).

2. *Id.* at 541–46.

3. See Melanie Reid, *Grounding Drones: Big Brother’s Tool Box Needs Regulation Not Elimination*, 20 RICH. J.L. & TECH. 9 (2014), <http://jolt.richmond.edu/v20i3/article9.pdf>.

4. JOINT PLANNING AND DEVELOPMENT OFFICE, UNMANNED AIRCRAFT SYSTEMS (UAS) COMPREHENSIVE PLAN: A REPORT ON THE NATION’S UAS PATH FORWARD 999 (2013) at 5 (noting that UAVs have been used in local crime scene investigations and search and rescue missions), [hereinafter UAS COMPREHENSIVE PLAN], available at https://www.faa.gov/about/office_org/headquarters_offices/agi/reports/media/UAS_Comprehensive_Plan.pdf.

5. Pax Dickinson, *Entrepreneurs at SXSW: Give Us Our Drones!*, BUS. INSIDER (Mar. 19, 2013, 11:56AM), <http://www.businessinsider.com/faa-ban-on-commercial-drones-2013-3>.

6. Brian Handwerk, *5 Surprising Drone Uses (Besides Amazon Drone Delivery)*, NAT’L GEOGRAPHIC (Dec. 2, 2013), <http://news.nationalgeographic.com/news/2013/12/131202-drone-uav-uas-amazon-octocopter-bezos-science-aircraft-unmanned-robot/>.

7. Ed Crooks, *Conoco in Landmark Alaska Drone Flight*, CNBC (Sept. 25, 2013, 2:09AM), <http://www.cnn.com/2013/09/25/conoco-in-landmark-alaska-drone-flight.html>.

8. *Airborne Drones Can Assess Storm Damage on Distribution Systems*, COMPACT EQUIPMENT (April 5, 2012), <http://compactequip.com/archives/airborne-drones-can-assess-storm-damage-on-distribution-systems-2/>.

9. Mae Anderson, *Drones Flying off the Shelves*, BOSTON GLOBE (Dec. 23, 2014), <https://www.bostonglobe.com/business/2014/12/23/drones-become-popular-holiday-gifts/BA2Wm4N6C9TEHPSEwtEfeL/story.html>.

Expert estimates vary, but the numbers are significant. A recent Teal Group Corporation study estimates that the current civil UAV market is approximately \$2.6 billion with forecasts of quadrupling to \$10.9 billion by 2015.¹⁰ A recent PricewaterhouseCoopers report estimates the current global market value of UAV-powered solutions at more than \$127 billion.¹¹ Over the next decade in the United States, the White House has predicted that the domestic UAV industry will grow to be an \$82 billion market and create more than 100,000 new jobs.¹² In just four years from now in 2020, the Federal Aviation Administration (FAA) estimates more than 7 million UAVs will be sold in the United States.¹³

Despite drone technology's extensive growth, frustration continues to grow with the FAA's lackluster effort to adequately address current regulation issues regarding UAVs. To fully take advantage of the safety and efficiency benefits of drones, companies need to be able to legally fly over populated urban and suburban environments. Unfortunately, operators of commercial drones are currently prohibited from flying beyond line of sight (BLOS) and flying over unsheltered people not involved with the operation of the drone.¹⁴ Considering the increasing economic demands, it is critical that the government enable drone operations that reflect a real-world operating envelope. Although technology often develops more quickly than policy, the future success of the UAV industry depends on swift and adequate laws that enable innovation and simultaneously maintain safety, privacy, and security.

II. FOUNDATIONS OF DRONE LAW

The Commerce Clause of the U.S. Constitution gives Congress authority to "regulate commerce with foreign nations, and among the several states."¹⁵ Congress created the Federal Aviation Agency through the

10. Teal Group Corp., *World Civil Unmanned Aerial Systems: Market Profile & Forecast* (2016), available at <https://dl.dropboxusercontent.com/u/1665888/TGCTOC/sample-WUASC2016.pdf>.

11. Michael Mazur et al., *Clarity From Above: PwC Global Report on the Commercial applications of Drone Technology*. PwC Poland (May 2016), available at <http://www.pwc.pl/pl/pdf/clarity-from-above-pwc.pdf>.

12. *White House Fact Sheet: New Commitments to Accelerate the Safe Integration of Unmanned Aircraft Systems*. August 2, 2016, available at <https://www.whitehouse.gov/the-press-office/2016/08/02/fact-sheet-new-commitments-accelerate-safe-integration-unmanned-aircraft>.

13. Alan Levin, *U.S. Says 7 Million Drones Will Take to Skies Annually by 2020*, BLOOMBERG (March 24, 2016, 12:50PM), <https://www.bloomberg.com/news/articles/2016-03-24/u-s-says-7-million-drones-will-take-to-skies-annually-by-2020>.

14. 14 C.F.R. § 107 (commonly referred to as "Part 107").

15. U.S. CONST. art. I, § 8; *see also* 49 U.S.C. §40103(a)(1) ("The United States Government has exclusive sovereignty of airspace of the United States.").

Federal Aviation Act of 1958,¹⁶ but in 1967, Congress moved the agency under the Department of Transportation and changed the name of the agency to the Federal Aviation Administration.¹⁷ Congress has given the FAA complete jurisdiction to regulate navigable airspace of aircraft by regulation or order.¹⁸

Until recently, neither of the definition sections in Title 49 of the United States Code¹⁹ nor Title 14 of the Code of Federal Regulations mentioned drones at all.²⁰ However, on August 29, 2016, the highly anticipated FAA rules regarding commercial operations of small unmanned aircraft systems went into effect.²¹ The new FAA rule (also known as “Part 107”) defines an unmanned aircraft as “an aircraft operated without the possibility of direct human intervention from within or on the aircraft.”²²

III. PART 107: CURRENT DRONE LAW AND LIMITATIONS

The introduction of the new FAA Part 107 rules earlier this year allows operators of small UAVs to legally fly a UAV weighing less than 55 pounds and under specified conditions.²³ While the rule represents acceptable progress overall and provides relatively straightforward guidance to commercial drone operators, the rules are quite restrictive. Among other conditions and absent a waiver,²⁴ these are the primary operator requirements imposed by Part 107:

- Commercial UAVs must weigh less than 55 pounds, including payload,²⁵
- UAVs are prohibited from flying above 400 feet above ground level or within 400 feet of a structure;²⁶
- UAVs are prohibited from flying at speeds faster than 100 mph;²⁷

16. Federal Aviation Act, Pub. L. No. 85-726, 72 Stat. 731 (1958).

17. See *A Brief History of the FAA*, Fed. Aviation Admin., available at https://www.faa.gov/about/history/brief_history/.

18. See 49 U.S.C. § 40103(b)(1) (Congress delegated to the FAA the job to “develop plans and policy for the use of the navigable airspace and assign by regulation or order the use of the airspace necessary to ensure the safety of aircraft and the efficient use of airspace.”).

19. 49 U.S.C. § 40102 (2012).

20. 14 C.F.R. § 1.1 (prior to Part 107 passage – prior to Aug. 29, 2016).

21. See *Press Release – DOT and FAA Finalize Rules for Small Unmanned Aircraft Systems*, FED. AVIATION ADMIN., available at https://www.faa.gov/news/press_releases/news_story.cfm?newsId=20515.

22. See 14 C.F.R. § 107(III)(D)(3).

23. 14 C.F.R. § 107.

24. See *Id.* at § 107(IV)(E)(4); see also *Request a Waiver/Airspace Authorization Small Unmanned Aircraft System (sUAS)*, FED. AVIATION ADMIN., available at https://www.faa.gov/uas/request_waiver/.

25. 14 C.F.R. § 107.

26. *Id.*

27. *Id.*

- UAVs are prohibited from operating over nonparticipants;²⁸
- The operator of the UAV must maintain visual line of sight with the UAV at all times;²⁹ and
- Operators of small UAVs must possess an FAA-certified remote pilot certificate.³⁰

The upper weight limit of 55 pounds is not based on any previous research that illustrates, for example, the maximum weights that are least likely to cause damage in a crash. Rather, the upper weight limit is an arbitrary number derived from previous rules designed for model aircraft.³¹ Unfortunately for many private and commercial drone operators, a drone with a maximum weight limit of 55 pounds is significantly restricted from flying long distances, carrying heavy payloads, and utilizing enough power from supplemental battery packs to power beneficial sensors, such as synthetic aperture radar.³² With regard to electrically powered UAVs, flying longer distances and carrying heavier payloads requires more power, which requires more batteries, which inevitably adds to the overall weight of the aircraft. For example, under the current legal framework, a commercial drone carrying a donated heart from a major-city hospital will be unable to fly across multiple states to a rural medical facility. The weight limit is not large enough to support such a long-distance flight and heavy payload.

Another severe limitation to commercial drone operators is the prohibition on flying over people not directly involved with the operation of the drone. This rule significantly constrains the economic potential of commercial drones. Little profit can be made from delivering packages to open fields and vacant lots that are blocks away from residential communities. Similarly, the prohibition on BLOS flying constrains the economic potential of commercial drones, as the only commercially viable operations are limited to aerial observation, such as aerial surveying, photography, and videography.

Commercial UAVs are also restricted to an airspace located below 400 feet. Although this ceiling limit is adequate for delivering small packages, inspecting pipelines, and filming for the movie industry, it is much too low for long-range missions and too low to accommodate larger UAV models. Ultimately, the FAA will need to allow UAVs to inte-

28. *Id.*

29. *Id.*

30. *Id.*

31. See Pub. L. 112-95, § 331(6).

32. See *What is Synthetic Aperture Radar (SAR)?*, Sandia Nat'l Laboratories (SAR systems "take advantage of the long-range propagation characteristics of radar signals and the complex information processing capability of modern digital electronics to provide high resolution imagery."), available at http://www.sandia.gov/radar/what_is_sar/.

grate fully into the National Airspace System (NAS) because safer and more fuel-efficient operations can be conducted at higher altitudes.

Lastly, pilot training and certification is minimal, as a remote pilot certification only requires an applicant to pass an online exam at an FAA Test Center to receive his or her license.³³ No practical experience or flight training is required.³⁴ Although these lenient standards might be sufficient for operators within the limitations of Part 107, they are most likely insufficient for commercial operators who are granted waivers to operate outside of the Part 107 restrictions. Per Part 107, “Most of the restrictions are waivable if the applicant demonstrates that his or her operation can safely be conducted under the terms of a certificate of waiver.”³⁵ For example, under the current legal framework, an applicant with no flight experience could receive a waiver to operate a commercial UAV that weighs 1,000 pounds and flies at 10,000 feet BLOS. Thus, Congress desperately needs to implement mandatory practical test standards similar to the civilian aircraft standards.³⁶

Part 107 is an important advancement in the FAA’s comprehensive plan to integrate UAVs of all types into the NAS. Unfortunately, the slow-moving policy makers continue to impede the full economic and technological potential of UAVs that could be realized with the help of a comprehensive and practical set of federal regulations.

IV. PROPOSED RULES AND THE FUTURE OF DRONE LAW

Following the passage of Part 107, the UAV industry has eagerly pushed the U.S. government to initiate testing of drone delivery systems. Although Part 107 will likely be expanded in the coming years, the current framework forbids commercial drones from operating more than 400 feet above ground level.³⁷ Thus, commercial drones are prohibited from operating in the NAS, which is a necessary threshold to overcome for viable drone delivery. Notwithstanding this restriction, industry giants have already invested resources into developing large-scale drone delivery systems in hopes that the FAA will propose a more comprehensive body of law governing UAV operations beyond line of sight and over urban areas.³⁸ For example, Amazon’s future delivery system would deliver packages weighing up to five pounds to customers by utilizing

33. 14 C.F.R. § 107.

34. *Id.*

35. *Summary of the Small UAS Rule*, FED. AVIATION ADMIN. (June 21, 2016), available at https://www.faa.gov/uas/media/Part_107_Summary.pdf.

36. *See Practical Test Standards*, FED. AVIATION ADMIN., available at https://www.faa.gov/training_testing/testing/test_standards/.

37. 14 C.F.R. § 107.

38. *See Amazon, Amazon Prime Air*, YOUTUBE (Nov. 29, 2015), https://www.youtube.com/watch?v=MXo_d6tNWuY; *see also X, the moonshot factory, Introducing Project Wing*, YOUTUBE (Aug. 28, 2014), <https://www.youtube.com/watch?v=cRTNvWcx9Oo>.

trucks and buses as recharging stations and mobile warehouses.³⁹ Recently, Domino's Pizza completed the first successful aerial pizza delivery via drone in New Zealand.⁴⁰ Additionally, Alphabet's Project Wing launched the burrito-by-drone initiative at Virginia Tech in September where they delivered Chipotle burritos to groups of students via drone.⁴¹

In addition to its UAV progress, Amazon has also made large investments in lobbying efforts over the past year to get the FAA and lawmakers to draft and pass legislation enabling urban area drone delivery. In response to Amazon's lobbying efforts, the FAA formed a task force earlier this year called the Aviation Rulemaking Committee to make recommendations on federal drone regulation.⁴² Following the creation of the task force, the Senate passed the FAA Reauthorization Bill in July 2016, which repeatedly emphasizes the need for allowing BLOS drone flight and strikes down state and local drone regulations.⁴³ Under the "Additional Rulemaking Authority" section, the bill further states, "It is the sense of Congress that beyond visual line of sight operations of unmanned aerial systems have tremendous potential to enhance research and development both commercially and in academics; to spur economic growth . . . through innovative applications of this emerging technology."⁴⁴ Citing opportunities in disaster relief and infrastructure work, the bill emphasizes several times the advantages of supporting drone technology development.⁴⁵

As previously mentioned, one of the most significant limitations to current drone operations is the bar on BLOS operations. To ensure that lawmakers draft and pass the most effective and practical rules regarding BLOS operations in the future, the FAA desperately needs to commission research on BLOS UAV flight operations. BLOS will inevitably be an expensive endeavor for the UAV industry, and until commercial

39. See U.S. Patent No. 9,496,736 (issued Nov. 15, 2016).

40. Neal Baker, *A SLICE ABOVE Domino's makes its first delivery by DRONE in New Zealand as stunt is hailed as 'one giant leap for pizza'*, THE SUN (Nov. 16, 2016), <https://www.thesun.co.uk/news/2194855/dominos-makes-first-delivery-by-drone-in-new-zealand-as-stunt-is-hailed-as-one-giant-leap-for-pizza/>.

41. Jacob Demmitt, *Google tests of delivering burritos by drone underway in Blacksburg*, THE DAILY PROGRESS (Sep. 13, 2016), http://www.dailyprogress.com/news/business/google-tests-of-delivering-burritos-by-drone-underway-in-blacksburg/article_1abb69ba-79fe-11e6-987a-77ffe5c4e8ec.html.

42. See *Advisory and Rulemaking Committees*, FED. AVIATION ADMIN., available at https://www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/committee/browse/committeeID/1.

43. FAA Extension, Safety, and Security Act, H.R. 636, 114th Cong. (2016) (often referred to as the "FAA Reauthorization Bill").

44. *Id.*

45. *Id.*

drone operators have a model set of laws to reference, industry leaders will not invest in related infrastructure and technology. For example, UAV companies need to know whether BLOS operations only require ADS-B,⁴⁶ full ground-based radar coverage, or if every UAV requires 360-degree target detection capabilities. To capture the full economic potential of the UAV industry, legislating BLOS operations is the foremost problem to be solved.

Despite reports that predict drone delivery legislation will not be available until 2020 at the earliest,⁴⁷ such legislation may actually be ushered in quicker than expected. Merely two weeks ago, the FAA sent to the White House Office of Information and Regulatory Affairs the proposed rulemaking for performance-based standards and means-of-compliance for the operation of small UAVs over unsheltered people not directly participating in the operation.⁴⁸ This development means that a proposed rule for small UAV flights over people is on the horizon, and it means that the White House is open to meeting with interested stakeholders during this time as the rule begins to enter the drafting process. In the coming months, UAV industry stakeholders and lawmakers will hopefully continue to fashion the proposed rules into a practical framework of laws conducive to drone delivery operations.

V. CONCLUSION

By keeping dialogue open between innovative companies and government, businesses that are researching and developing UAV technology that can change the world will be able to prosper. More importantly, maintaining such an open and transparent dialogue will win the public's trust and ultimately keep the public safe. As long as innovation continues to grow and legislation progresses, commercial UAVs will soon become just as indispensable as the cell phones we carry everyday—tools that make us more productive, safer, and more connected.

46. *Air Traffic Services Brief – Automatic Dependent Surveillance-Broadcast (ADS-B)*, AIRCRAFT OWNERS AND PILOTS ASS. (Jun. 3, 2015), <https://www.aopa.org/advocacy/advocacy-briefs/air-traffic-services-brief-automatic-dependent-surveillance-broadcast-ads-b> (defining ADS-B as “a cornerstone of NextGen air traffic modernization” that “transmits information about altitude, airspeed, and location derived through GPS from an equipped aircraft to ground stations and to other equipped aircraft in the vicinity.”).

47. Andy Pasztor, *Package-Delivery Drones Likely Years Away From Federal Approval*, WALL ST. J. (Sep. 29, 2016, 4:36 p.m.), <http://www.wsj.com/articles/package-delivery-drones-likely-years-away-from-federal-approval-1475154227>.

48. *Operations of Small Unmanned Aircraft Over People*, OFFICE OF INFORMATION AND REGULATORY AFFAIRS, RIN: 2120-AK85 (Fall 2016), <http://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201610&RIN=2120-AK85>.

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